Architecture Evaluation at the SEI

Software Solutions Division

Why Evaluate Software Architecture?

For many organizations, the achievement of business and mission goals is frustrated by software system problems such as

- poor quality—seen in systems crashing or behaving unpredictably, or users judging that a system is unusable
- slow time to market—seen in missed integration deadlines due to difficulty in identifying root causes of problems

How do you know if a software architecture is deficient or at risk relative to its targeted system qualities?

The answer is to evaluate it. Software architecture evaluation should be a standard part of any software development lifecycle. Architecture evaluation is a cost-effective way of mitigating the substantial risks associated with this highly important artifact of product development.

The achievement of a software system's quality attributes depends much more on the software architecture than on code-related issues such as language choice, fine-grained design, algorithms, data structures, and testing. Most complex software systems must be modifiable and have good performance. They may also need to be secure, interoperable, portable, and reliable. But for any particular
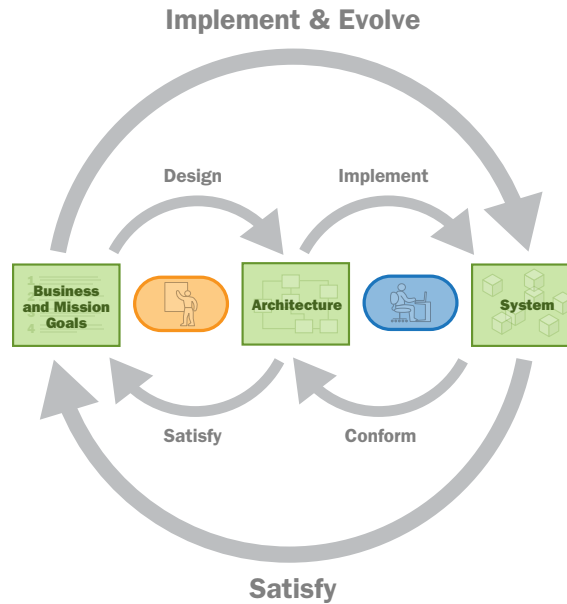
We use architecture as the focal point for performing ongoing analyses to gain increasing levels of confidence that systems will support their missions.

system, what precisely do these quality attributes—modifiability, security, performance, reliability— mean? How do you analyze a system to determine whether it meets these desired qualities? When can such an analysis occur? What happens when two important quality attributes conflict with each other? How should you capture and analyze the tradeoffs?

Benefits of Architecture Evaluation

The SEI's architecture evaluation methods can help you improve software development and quality by using architecture to gain early confidence in achieving system-related business and mission goals. Architecture evaluation results in

- early identification and mitigation of design risks—yielding fewer downstream, costly problems

and more cost savings during integration and test
- predictable system quality— creating a competitive advantage for your organization
- flexibility—enabling cost-effective system evolution and sustainment

Our methods are informed by the experiences of SEI staff members who have worked directly with dozens of organizations over the past 20 years, helping them achieve significant cost reductions, quicker time to market, and higher product quality by applying architecture-centric practices to the development of their systems. With the aim of improving software systems of all types, we have applied our research results in our work with these organizations, and we have applied feedback from our work with these organizations to further our research.

How We Can Help

The SEI has experience evaluating architectures for industry, government, and the Department of Defense, resulting in a breadth of perspective on many types of software and systems, systems of systems, enterprise IT systems, and real-time embedded systems. We have also performed architecture evaluations in different modes throughout the development lifecycle:

- architectures for proposed new systems that have not yet begun development
- incremental evaluation as teams are developing the architecture
- architectures of legacy systems in preparation for modernization efforts

Beginning with the business drivers for the system and flowing down to the required quality attributes, these stakeholder-focused methods help organizations make better decisions on their paths to developing or modernizing software architectures.

The SEI's methods for architecture evaluation can be used alone or in combination to obtain early and continuous benefits to any software development project.

- Architecture Tradeoff Analysis Method® (ATAM®)—the leading method for evaluating how well software architectures meet quality attribute goals, proven over decades of use (pictured below)
- System ATAM and System of Systems Architecture Evaluation— for evaluating system and SoS architectures, respectively, to ensure early identification of quality attribute inconsistencies and architectural risks
- Architecture Improvement Workshop—for improving software architectures relative to quality attribute goals

Our Courses

The SEI has built a comprehensive course of study for architecture evaluation, and we offer software architecture courses and certificate programs. More than 17,000 people from more than 1,400 organizations have attended courses in the SEI Software Architecture Curriculum, and more than 2,200 people have earned certificates conferred by the SEI.

- Courses in software architecture essentials, documenting software architecture, software architecture design and analysis, ATAM evaluators, and modeling system architectures
- Software Architecture Professional and ATAM Evaluator certificates

Related Website

sei.cmu.edu/architecture

Worflow of the Architecture Analysis Tradeoff Method
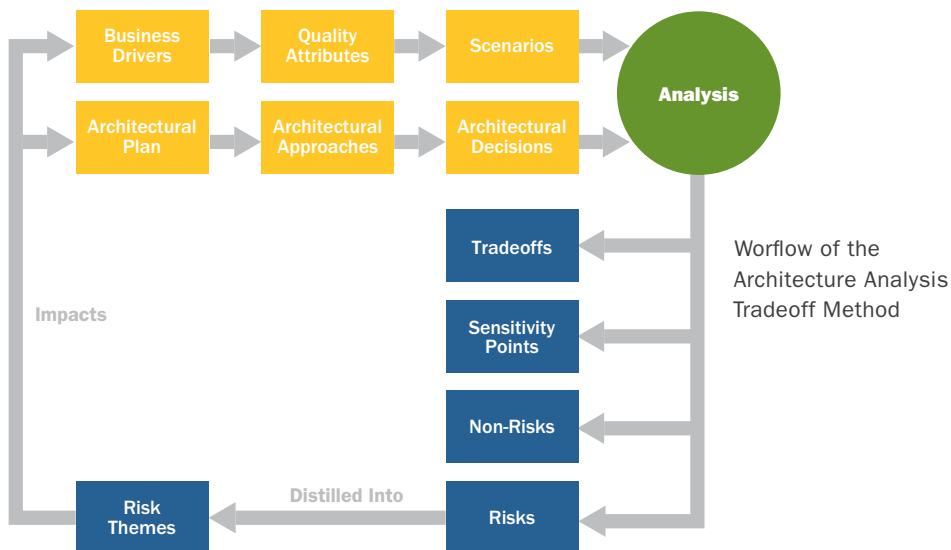
About

For four decades, the Software Engineering Institute (SEI) has been helping government and industry organizations to acquire, develop, operate, and sustain software systems that are innovative, affordable, enduring, and trustworthy.

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